UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/735,097	12/11/2000	John J. Weisgerber	GSIL0148 PUS	5342

22045 7590 04/09/2004

BROOKS KUSHMAN P.C.
1000 TOWN CENTER
TWENTY-SECOND FLOOR
SOUTHFIELD, MI 48075

EXAMINER	
KIBLER, VIRGINIA M	

ART UNIT	PAPER NUMBER
2623	9

DATE MAILED: 04/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/735,097	WEISGERBER ET AL.	
	Examiner	Art Unit	
	Virginia M Kibler	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment received on 1/20/04 has been entered. Claims 1-28 remain pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 8, 11, 12, 18, 26, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)*.

Regarding claim 1, Mengel discloses imaging the components and the mounting substance on the PCB to obtain 3D and 2D data associated with the components and material surrounding the components (Page 787, col. 2, para. 1), and processing the 3D and 2D data in combination to find the locations of the components as a function of the 3-D and 2-D data and based component features as differentiated from the mounting substance or the circuit board on which the components are placed (Pages 788-789, in particular Figures 2 & 4-7).

Regarding claim 2, Mengel discloses the mounting substance as solder paste (Abstract, lines 6-9).

Regarding claims 11 and 12, the arguments analogous to those presented above for claims 1 and 2 are applicable to claims 11 and 12, respectively.

Regarding claims 8 and 18, Mengel discloses utilizing both the 2-D and the 3-D data in combination to prune the circuit board from the mounting substance (Figure 7, pages 788-789).

Regarding claim 26, Mengel discloses comparing at least one of a predetermined 3-D size and shape of a component with 3-D data representative of the component so as to verify component presence (Pages 788-790).

Regarding claim 27, Mengel discloses comparing at least one of a predetermined 3-D size and shape of an attribute of the component with 3-D data representative of the attribute to verify component presence (Pages 788-790).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5, 9, 15, 19, 21-25, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)* as applied to claims 1 and 11 above, and further in view of Montillo et al. (6,526,165).

Regarding claims 5 and 15, Mengel does not appear to recognize calculating the centroids of the feet of the leads. However, Montillo et al. ("Montillo") teaches that it is known to calculate the centroids of the feet (Col. 6, lines 3-40). Therefore, it would have been obvious to

one of ordinary skill in the art at the time of the invention to have modified the inspection of solder joints disclosed by Mengel to include calculating the centroids of the feet as taught by Montillo because it is well known and accurately inspects the placement of the object by properly registering the object with the pads on a PCB (Col. 1, lines 31-37).

Regarding claims 9 and 19, Mengel does not appear to recognize pruning the leads from the mounting substance. However, Montillo teaches that it is known prune the foot of the leads (Col. 11, lines 54-56). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the pruning disclosed by Mengel to include pruning the foot from the leads as taught by Montillo because it isolates the foot and increases accuracy in determining its parameters (Col. 11, lines 31-46).

Regarding claim 21, the arguments analogous to those presented above for claim 1 are applicable to claim 21. Mengel does not appear to expressly state isolating the endcaps from their bodies. However, Montillo teaches that it is known to process the 2D data in order isolate the leads (Col. 11, lines 31-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the processing of the 2D data disclosed by Mengel to include isolating the endcaps, as taught by Montillo, because it is well known in the art of inspection and provides additional parameters to check the location and orientation of the component.

Regarding claims 22-25, Mengel does not appear to recognize forming a blob image and masking with the blob image. However, Montillo teaches that it is known to form a blob image and perform masking with the blob image (Col. 13, lines 62-67, Col. 14, lines 1-15). Montillo teaches blob analysis which entails using an image segmentation threshold to determine both the

location and orientation. Montillo further teaches detecting an edge of the blob image and applying a bounding rectangle to the edge wherein the bounding rectangle is a minimum rectangle and is used to determine component position and orientation (Col. 13, lines 62-67, Col. 14, lines 1-15; Figure 12b, element 1210). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the evaluation of the component detection as disclosed by Mengel to include forming a blob image and masking as taught by Montillo because blob analysis is a standard tool for determining the center of mass, area, and bounding box of a region of connected pixels.

Regarding claim 28, the arguments analogous to those presented above for claim 22 are applicable to claim 28.

6. Claims 3, 4, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)* as applied to claims 1 and 11 above, and further in view of Prosky (4,159,648).

Regarding claims 3 and 13, Mengel does not appear to recognize the mounting substance as an adhesive. However, Prosky teaches that it is known to use an adhesive as a mounting substance (Col. 4, lines 47-49). It would have been an obvious matter of design choice to have modified the solder paste disclosed by Mengel to an adhesive, as taught by Prosky, since applicant has not disclosed that the adhesive solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well.

Regarding claims 4 and 14, the arguments analogous to those presented above for claim 3 are applicable to claims 4 and 14. Note, Prosky discloses a glue (Col. 4, lines 47-49).

7. Claims 6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)* as applied to claims 1 and 11 above, and further in view of Roy et al. (5,956,134).

Regarding claims 6 and 16, Mengel does not appear to recognize calculating the average height of the feet. However, Roy teaches that it is known the leads have feet and the step of processing includes the step of calculating the average height of the feet (Col. 6, lines 5-13). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the inspection of electronic components disclosed by Mengel to include calculating the average height of the feet as taught by Roy because it is well known in the art and determines if the conductor leads are in a proper position with respect to each other.

8. Claims 7 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)* as applied to claims 1 and 11 above, and further in view of Kent et al. (6,047,084).

Regarding claims 7 and 17, Mengel discloses determining the quality of solder joints using test parameters and degree of inspection including solder bridges and excess solder (Page 790). Mengel does not expressly to recognize calculating a percentage of the mounting substance. However, Kent et al. ("Kent") teaches that it is known to calculate the border violation percentage of the mounting substance (Col. 12, lines 4-25). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the solder joints inspection disclosed by Mengel to include calculating the border violation

percentage of the mounting substance as taught by Kent because it is well known in the art and ensures physical and electrical connectivity of the solder to the pad (Col. 12, lines 23-26).

9. Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mengel (*Automated Inspection of Solder Joints on PC Boards by Supplementary Processing of 3D and gray-level Images)* as applied to claims 1 and 11 above, and further in view of Paulsen et al. (6,522,777).

Regarding claims 10 and 20, Mengel does not appear to recognize including using upper and lower thresholds to find the locations. However, Paulsen et al. ("Paulsen") teaches that it is known to use upper and lower thresholds to find the locations (Col. 6, lines 39-47). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the comparison disclosed by Mengel (Page 788, col. 2) to include using an upper and lower thresholds as taught by Paulsen because it is a methodology routinely implemented in the art to ensure coplanarity within a predetermined tolerance.

Response to Arguments

10. Applicant's arguments filed 1/20/04 have been fully considered but they are not persuasive.

Summary of Applicant's Argument: Mengel provides for use of 3-D data in some instances and 2-D data in other instances, not processing the 3-D and 2-D data in combination to find locations of electronic components mounted and a printed circuit board as a function of the 3-D and 2-D data and based on at least one of identified leads, endcaps, and component features

as differentiated from at least one of the mounting substance and the circuit board. Mengel fails to disclose the use of 2-D data for combination with the 3-D data.

Examiner's Response: Mengel discloses processing the 3D and 2D data in combination to find the locations of the components as a function of the 3-D and 2-D data and based component features as differentiated from the mounting substance or the circuit board on which the components are placed (Pages 788-789, in particular Figures 2 & 4-7), as specified. Mengel discloses processing of 3D and gray level (2D) information for edges and histogram as shown in Figure 2. Mengel further discloses combined evaluation of gray-level and height images (Page 788, Characteristics inspection on solder joints).

Conclusion

11. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Virginia M Kibler whose telephone number is (703) 306-4072. The examiner can normally be reached on Mon-Thurs 8:00 - 5:30 and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Virginia Kibler
4/8/04

MEHRDAD DASTOURI
PRIMARY EXAMINER